HEXING

User Manual

Three Phase Energy Meter

HXE34-KP(Direct Connection)

Hexing Electrical Co., Ltd.
www.hxgroup.cn
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Introduction

Range of validity

The present user manual applies to the meter specified on the title page.

Purpose

The user manual contains all the information required for application of the meters for the intended purpose. This includes:

- Provision of knowledge concerning characteristics, construction and function of the meter
- Information about possible dangers, their consequences and measures to prevent any danger
- Details concerning the performance of all work throughout the service life of the meter

Target group

The contents of this user manual are intended for technically qualified personnel of energy supply companies responsible for the meter planning, installation, operation and maintenance of the meter.

Hexing Electrical reserves the right of final interpretation

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1. Overview

HXE34-KP three phase four wire prepaid keypad meter is designed for the purpose of prepayment. Its main functions include energy measurement, data display, communication, prepayment, contactor control, keypad input and inquiry, anti-tampering, etc.

1.1 Front View

Front view of HXE34-KP(for reference)

1.2 Highlights

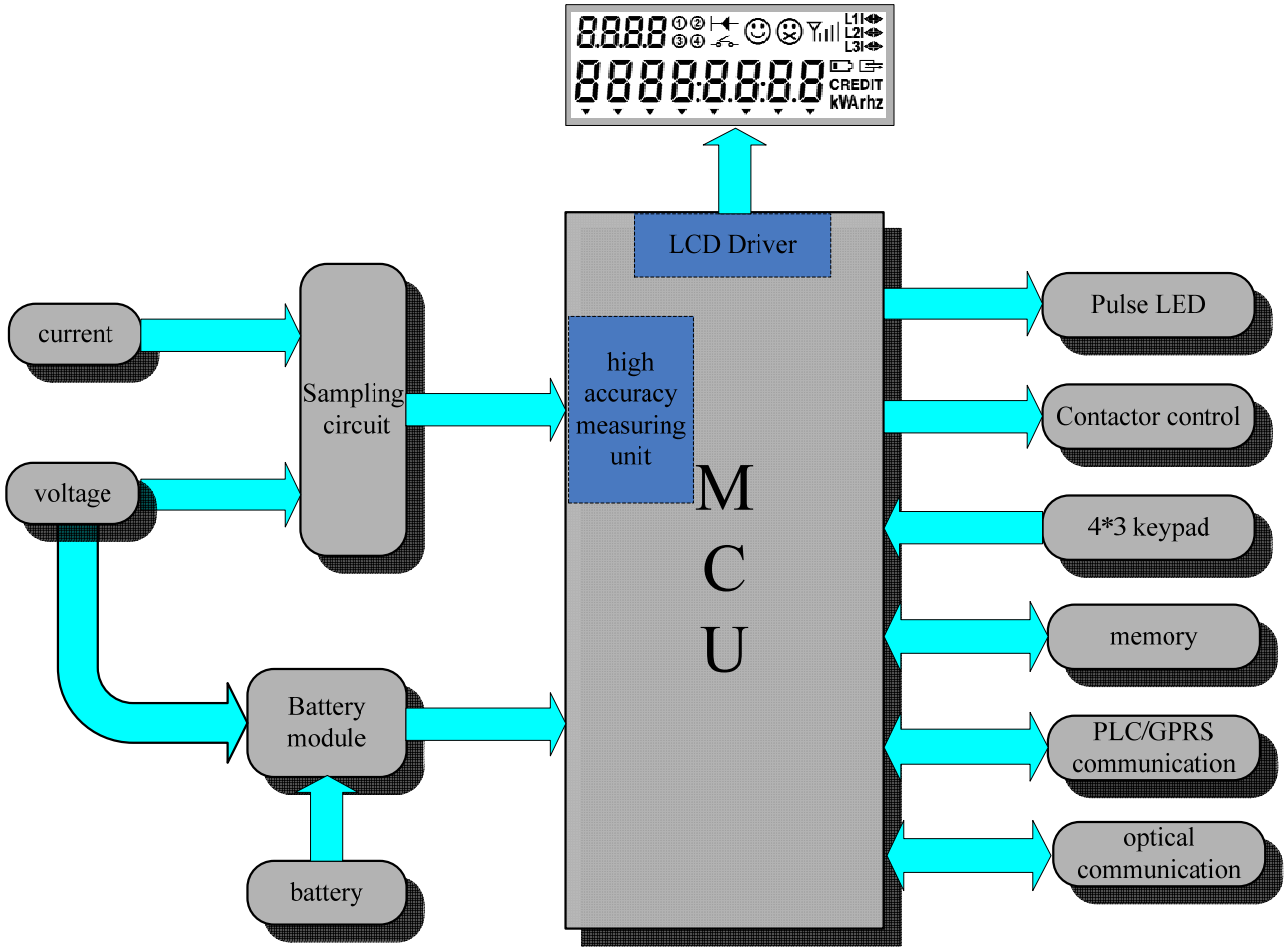
- Prepayment mode solves the problem of difficult collection of electricity fee.
- Based on STS (Standard Transfer Specification), which is an open secure transfer standard and the only international specification on prepaid system.
- DLMS/COSEMCommunication protocol, which ensures good interoperability.
- Closed type design avoids external attack through open interface.
- Human machine interface available: keypad input and LCD display.
- Recharge information is transferred in the form of TOKEN.
- Built-in contactor, and varied control methods are supported.
- Pluggable PLC/GPRS module supports remote communication.
- Some basic queries and easy operation can be done via keypad.
- Rich event records.

- Support logoff of meter, and the credit in meter can be returned to customer.

1.3 Principle of Operation

HXE34-KP comprises of following components:

- Energy measuring unit: voltage sampling, current sampling, measuring integrated circuit;
- Data processing unit: MCU, memory;
- Power supply unit: AC power supply, battery;
- Input/output unit: LCD display, PLC/GPRS communication, optical port, keypad;
- Load control unit: contactor.



1.4 Basic Parameters

Parameter	Characteristics
Reference voltage	3*220/380VAC

Working voltage	70％Un～120％Un
Frequency	(50±5)Hz
Current	10(100)A
Accuracy	Cl 1.0 for kWh
Starting current	4‰Ib
impulse constant	Active: 1000 imp/kWh
Working temperature	Normal working temperature: -25℃～+60℃ Extreme working temperature: -40℃～+70℃
Relative humidity	≤95%
Power consumption in voltage circuit	≤1.5W, 10VA
Power consumption in current circuit	≤1VA
Degrees of protection	IP54
Fast transient burst	4kV
Electrostatic discharges	Contact discharge8kV, air discharge 15kV
Insulation	1 minute under 4kV, 50Hz
Impulse voltage	8 kV

1.5 Standards

Standards	Descriptions
IEC62052-11	Electricity metering equipment (a.c.) – General requirements, tests and test conditions – Part 11: Metering equipment
IEC62053-21	Electricity metering equipment (a.c.) - Particular requirements - Part 21: Static meters for active energy (classes 1 and 2)
IEC62053-31	Electricity Metering Equipment (a.c.) - Particular Requirements - Part 31: Pulse Output Devices for Electromechanical and Electronic Meters (Two Wires Only)

IEC62055-41	Electricity metering - Payment systems - Part 41: Standard transfer specification (STS) - Application layer protocol for one-way token carrier systems
IEC62055-51	Electricity metering - Payment systems - Part 51: Standard transfer specification (STS) - Physical layer protocol for one-way numeric and magnetic card token carriers
IEC62056-61	Electricity metering - Data exchange for meter reading, tariff and load control - Part 61: Object identification system (OBIS)
IEC62056-62	Electricity metering - Data exchange for meter reading, tariff and load control - Part 62:Interface classes
IEC62056-46	Electricity metering - Data exchange for meter reading, tariff and load control - Part 46: Data link layer using HDLC protocol
IEC62056-53	Electricity metering - Data exchange for meter reading, tariff and load control - Part 53: COSEM application layer
IEC62056-47	Electricity metering – Data exchange for meter reading, tariff and load control – Part 47:COSEM transport layer for IP networks

2. Main Functions

2.1 Measurement

2.1.1 Energy

- The meter measures both forward and reverse active energy in the range of 000000.00~999999.99kWh.
- Measurement mode: Forward= forward + reverse

  Reverse= reverse

2.1.2 Instantaneous Values

- Active power(phase A, phase B, phase C)
- Voltage(phase A, phase B, phase C)
- Current(phase A, phase B, phase C)
- Power factor(phase A, phase B, phase C)

- Frequency
- AB phase angle, AC phase angle

2.1.3 Billing Data

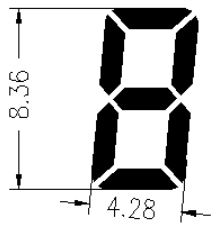
- Monthly frozen energy: last 12 months data of monthly frozen occurrence time, total active energy,total reverse active energy.
- Daily frozen energy: last 62 days data of daily frozen occurrence time, total active energy, total reverse active energy.
- Monthly frozen credit: last 12 months data of monthly frozen occurrence time, remaining credit.
- Daily frozen credit: last 62 days data of daily frozen occurrence time, remaining credit.

Monthly frozen time is configurable in the format of XX(day):XX(hour) from 1st to 28th of every month. The default setting is 1st day 00 hour. Daily frozen time is configurable in the format of XX(hour):XX(minute). The default setting is 00:00.

2.2 LCD Display

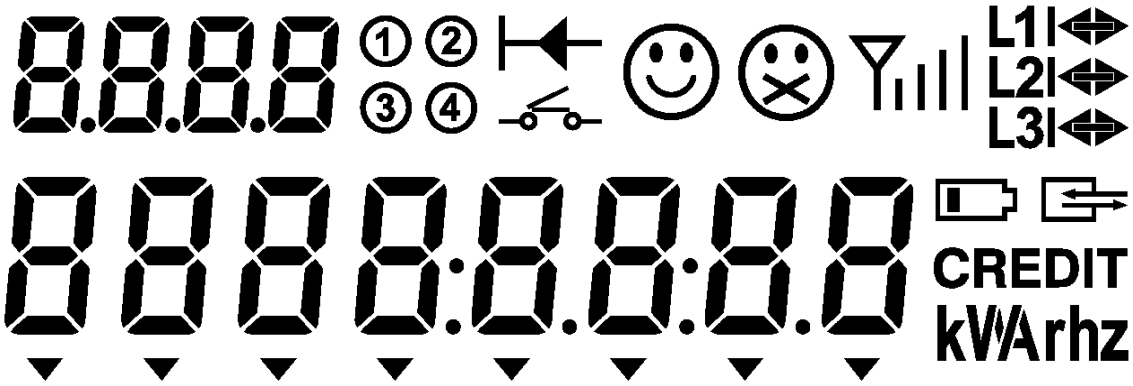
2.2.1 Physical Characteristics

- Visual size of LCD: 67.5mm*21mm;
- Size of digit: 4.3mm*8.4mm;



- Working temperature of LCD: -30℃～＋80℃;
- High-contrast;
- Wide viewing angle;
- Anti-ultraviolet.

2.2.2 LCD Full Screen Display



2.2.3 LCD Display Items

Display item	Description
	Data display area
	OBIS code display area
	Unit display area
	Communication
	Reverse indication
	Low battery
	Contactor connected
	Contactor disconnected
	Recharge successful
	Recharge failed
	GPRS signal
▼（S1~S8）	Event status indicator

2.2.4 LCD Display Modes

There are five types of LCD display modes: automatic scrolling display, push button display, keypad display, power off display, and meter abnormal display.

- Automatic scrolling display

  Meter display mode is default as automatic scrolling display when power on. After meter operates for a certain period, which is automatic scrolling display interval default as 3s,

LCD display will switch automatically to next page in sequential order circularly. Maximum 32 display pages can be configured, for details please refer to Annex A.

- Push button display

  Once press the button in the front, automatic scrolling display/power off display will switch to push button display. LCD display switches to next page in sequential order circularly at each button-push. When there is no button-push within 30s, push button display will switch back to automatic scrolling display/power off display. Maximum 32 display pages can be configured, for details please refer to Annex A.

- Keypad display

  When press the numbers in the keypad, the meter will enter keypad display mode and display relevant numbers in LCD. If there is no keypad operation after 20s, the meter goes back to automatic scrolling display mode(when there is power in the grid) or power-off display mode(when there is no power in the grid). When pressing effective shortcut key or TOKEN and press ENTER key, the meter will display relevant indicating message. After 10s it will go back to automatic scrolling display mode(when there is power in the grid) or power-off display mode(when there is no power in the grid).

- Power off display

  Meter only displays credit of meter during power off.

- Meter abnormal display

  Once fault or damage of meter memory is detected, automatic scrolling display will stop and LCD will be fixed to display abnormal code “Error”.

2.2.5 Status Indicator

- When meter cover is open, ▼S2 indicates;
- When terminal cover is open, ▼S3 indicates;
- When meter is overloaded, ▼S4 indicates;
- **When meter cover open and terminal cover detection function is disabled, ▼S5 indicates;**
- When meter is three-phase unbalance, ▼S6 indicates (3-phase meter only).

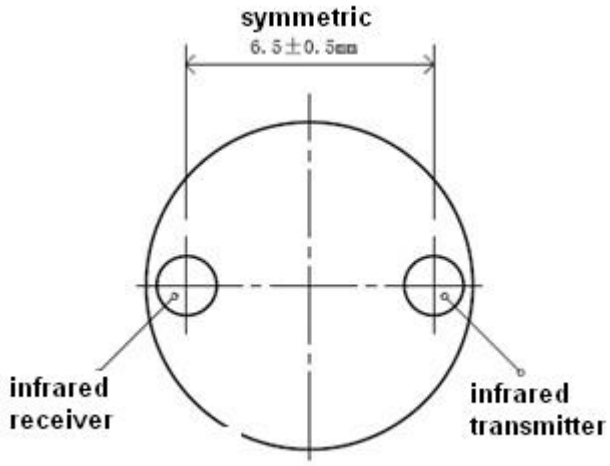
2.3 Communication Interfaces

Meter has one optical communication port,and one PLC/GPRS communication port(only one communication module between PLC and GPRS can be chosen for one meter). The two communication interfacesare independent from each other, thus, failure of one communication

interface will not affect the other.

2.3.1 Optical Communication

- It is in compliance with IEC 62056-21 standard: Electricity metering - Data exchange for meter reading, tariff and load control - Part 21: Direct local data exchange.



- It is in compliance with DLMS standard (E mode).
- Initial baud rate is 300bps, 7 data bits and 1 parity bit; after successful handshake, baud rate is 9600bps, 8 data bits and 1 parity bit.
- Via optical communication user can read data from meter and do configuration through PC software or HHU.

2.3.2 PLCCommunication

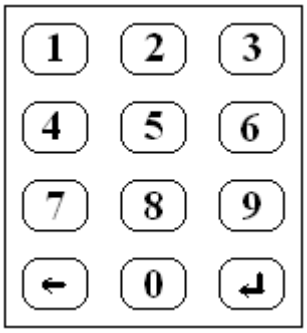
- Baud rate is 4800bps, 8 data digits and without check digit.
- It is in compliance with DLMS standard (direct HDLC mode).
- Meter reading and configuration can be realized through DCU via PLC communication in AMI network.
- Pluggable PLC communication module.

2.3.3 GPRS Communication(optional with PLC)

- Baud rate is 4800bps, 8 data digits and 1 parity digit.
- It is in compliance with DLMS standard (COSEM-on-IP mode). The master station could read meter data and configure meter.
- Meter reading and configuration can be realized through DCU via GPRS communication in AMI network.
- GPRS and GSM communication methods.
- Pluggable GPRS communication module.
- GPRS signal strength indicator:

- : signal strength<9, means there is no signal
- : 9<= signal strength<14, means signal is weak
- : 14<= signal strength <19, means signal is normal
- : 19<= signal strength <23, means signal is good
- : 23<= signal strength, means signal is very good

2.4 Keypad



There are totally 12 keys in this keypad. 0～9 are number keys, " ← " is clear key, " ↵ " is ENTER key.

2.5 STS

2.5.1 Recharge

●Customer goes to the vending station to purchase electricity and gets a customer card for the first purchase.

● Customer enters 20-digit TOKEN via keypad. If the input is wrong, it could be modified by ← . Push ↵ after confirmation.

●When the recharge is successful, meter displays

●When TOKEN is wrong, meter displays

●When TOKEN has been used, meter displays

●When TOKEN expires, meter displays

●When security key expires, meter displays

●When charging amount exceeds the accumulated charging amount limit, meter displays

2.5.2 Management TOKEN

STA encryption is adopted for this type of TOKEN. They can only be used for one specific meter at one time.

● Set maximum power

- Set 3-phase unbalance

- Clear meter credit
- Clear event status
- Switch from prepayment mode to post-payment mode
- Switch mode from post payment mode to prepayment mode

2.5.3 Modify Security Key

Two management TOKEN should be input together to modify security key. It doesn't matter which one is input first. But after user inputs the first TOKEN, he/she shall input the second TOKEN within specified period(2min by default). Otherwise, the first one will become invalid.

Input the first TOKEN:

Input the second TOKEN, and security key is modified successfully.

2.5.4 Test TOKEN

This type of TOKEN is not encrypted by STA. It could be used to test any prepayment keypad meter which is compliant with STS.

- Contactor test

  0000-0000-0001-5099-7584

If the contactor is connected, test disconnecting. If contactor is disconnected, test connecting. Contactor goes back to initial status after 2 minutes.

NOTE: If the credit balance is <=0, connecting contactor shall not be tested.

- LCD test

0000-0000-0001-6777-4880

Test LCD full screen display, check if any code is absent.

- Display total active forward energy

  0000-0000-0002-0132-8896

- Display security key version

1844-6744-0738-4377-2416

- Display tariff index

3689-3488-1475-5332-2496

- Display maximum power

0000-0000-0012-0797-4400

- Display meter status

0000-0000-0022-8172-8512

- Display instantaneous power

0000-0000-0044-2920-8064

- Display meter version No.

0000-0000-0087-2419-5840

- Display 3-phase unbalance

0000-0000-0173-1410-5857

● Complete test

5649-3153-7254-5031-3471

Make contactor test, LCD display test, display total active forward energy test, display security key version test, and display tariff index display in turn. The interval between each test shall be 8s~10s.

2.6 Short cut Keys

The meter provides a serial of shortcut code for customer to get meter information and make relevant operation thru the keypad:

Short code	Function	Short code	Function
800	Total active forward energy	**801**	Credit balance
802	Date	**803**	Time
804	Meter serial number	**805**	SGC number
806	Contactor operation reason	**807**	Meter status
808	Total instantaneous power	**809**	Tariff index
810	Overdraft limit	**811**	Emergency credit
812	Cancel audible alarm	**813**	Total active energy of yesterday
814	Total active energy of current month	**815**	Last recharge date
816	Last recharge time	**817**	Last recharge amount
818	Return logoff TOKEN	**819**	Power off times
820	Total active energy of last1 month	**821**	Total active energy of last2 month
822	Total active energy of last3 month	**823**	Total active energy of last4 month
824	Total active energy of last5 month	**825**	Total active energy of last6 month
830	TOKEN number of last 1 recharge	**831**	TOKEN code of last 2 recharge
832	TOKEN number of last 3 recharge	**833**	TOKEN code of last 4 recharge
834	TOKEN number of last 5	**835**	TOKEN code of last 6 recharge

	recharge		
836	TOKEN number of last 7 recharge	**837**	TOKEN code of last 8 recharge
838	TOKEN number of last 9 recharge	**839**	TOKEN code of last 10 recharge
865	meter is in normal mode		

2.7 Low Credit Alarm

In order to remind the user to recharge in time and to avoid inconvenience of power disconnection, meter provides the function of low credit alarm, including visual alarm and audible alarm.

Visual alarm:

- When there is enough remaining credit, LED is green.
- When remaining credit is less than low credit alarm level 1, LED is red.
- When remaining credit is less than low credit alarm level 2, LED is red and flashes.

Audible alarm:

When remaining credit is less than low credit alarm level 3, buzzer is on. Customer can turn off the buzzer through manual token insertion. In consideration of not disturbing customer during rest time, audible alarm turns off automatically during 20:00-08:00.

- Cancel audible alarm

- no need to cancel audible alarm now

2.8 Emergency Credit

Contactor disconnects automatically and there is no power supply when remaining credit reaches zero. However, in case that customer needs power supply and cannot go to purchase power immediately, meter provides the function of emergency credit. Customer can use short code 811 to get emergency credit and restore the power.

Under the mode of emergency credit, meter calculates the remaining credit as a minus value. When remaining credit plus emergency credit reaches zero, contactor disconnects again. Function of emergency credit can only be used once before next recharge. The emergency credit will be deducted automatically during next recharge.

- Emergency credit

- Emergency credit has been used:

- No need to use emergency credit now:

- The meter is still lack of credit after emergency credit:

- Emergency credit could not be used because the account has been closed.

2.9 Friendly Mode

Meter provides two modes of power interruption: normal power interruption and friendly mode.

Under the mode of normal power interruption, contactor disconnects when remaining credit reaches zero. However, under friendly mode, in order to ensure consumer's power consumption, contactor doesn't disconnect during certain periods, i.e. overnights, at weekends or holidays, even if remaining credit reaches zero. Certain periods are configurable.

2.10 SMS Recharge

2.10.1 Input TOKEN number

2.10.1.1 Input Format

P＋20-digit TOEKN number, such as 11223344556677889900.

2.10.1.2 Output Format

- Charging code successful

Yüklənmişdirxxxxx.xx Manat, Balansxxxxx.xx Manat

Charging amount

Meter credit balance

- TOKEN code failed

Etibarsız şifrə

2.10.1.3 SMS Charging

- The customer gets 20 digits TOKEN from the utility.
- Edit SMS in mobile phone, the format is P+ 20-digit TOKEN, then send the SMS to the SIM card number of corresponding meter.
- Meter will reply recharging SMS to customer's mobile phone.

2.10.2 Input Shortcut Key

2.10.2.1 Input Format

Q＋shortcut key, such as input Q800 to check total active energy.

2.10.2.2 Output Format

●total active energy

Cəmi aktiv enerji xxxxxx.xxkVts.

●total active energy of last 1~6 month

Əvvəlki 1/2/3/4/5/6 ayın cəmi aktiv enerjisixxxxxx.xxkVts.

●meter credit balance

Balansdakı qalıq xxxxxx.xx Manat.

●Shortcut Key failed

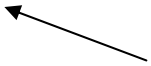
Yanlış şifrə.

2.10.3 SMS Alarm

2.10.3.1 Credit Alarm

When the meter's credit balance is less than 1, the meter will initially send one SMS to user's mobile phone to remind him to recharge in time..

Balansın Azalması, xxxxxx.xxManat qalmışdır



Meter credit balance

2.10.4 Mobile Phone Number Binding

●Input format:B+ meter serial number +*mobile phone number that need binding

●binding failed: Mobil qeydiyyat alınmadı.

●binding successful: Mobil qeydiyyat uğurlu oldu.

2.11 Load Control

● When active power is larger than threshold A and for a consecutive period which exceeds delay time B, contactor disconnects.

● Then, after delay time C, contactor reconnects and meter starts over the process of overload detection.

● If there are overload events for consecutive 5 times, times of overload events is reset to zero and contactor reconnects after delay time D. Then, meter starts over the process of overload detection.

● If there is no overload event for consecutive time E, times of overload events is reset to zero.

NOTE: during the load control process, if there is any power on and power off event, setting of max. power, or clearing events, the load control will go back to initial status and restart.

2.12 Event Records

2.12.1 Event Type 1

Meter records total occurrence times of events, total duration, start time and end time of last 10 events.

- power off
- meter cover open
- terminal cover open
- over-voltage in phase A, B and C
- under-voltage in phase A, B and C
- 3-phase unbalance
- Neutral line missing

2.12.2 Event Type 2

Meter records total occurrence times of events, recharge time, recharge amount and recharge TOKEN of last 10 events.

- Recharge event

2.12.3 Event Type 3

Meter records total occurrence times of events, occurrence time and reason of last 10 events.

- contactor disconnected
- contactor reconnected

2.12.4 Event Type 4

Meter records total occurrence times of events, time before synchronization and time after synchronization of last 10 events.

- time synchronization

2.12.5 Event Type 5

Meter records total occurrence times of events and occurring time of last 10 events.

- overload

2.12.6 Event Type 6

Meter records total occurrence times of events, occurring time of last 10 events, subclass of management TOKEN, and management TOKEN.

- time synchronization

2.13 Load Profile

● 8 channels

●The beginning address and storage space is set in the factory. It can't be changed after leaving factory.

●the capture period and capture objects of each channel is configurable.

●max. 10 capture objects can be selected for each channel. And for easy reading purpose, the first capture object shall be fixed as time.

●capture objects: time, forward active energy, reverse active energy, voltage, current, active power, power factor, frequency, meter credit balance.

●storage space: 4M bytes ForFlash.

2.14 Daylight Saving Time

●max. 20 years' DST setting is supported;

●after entering DST, meter's time is 1 hour ahead, vice versa.

2.15 Contactor

2.15.1 Physical Characteristics

●5,000 operations under rated current condition;

●10,000 operations under no-load conditions.

NOTE: In order to make sure reliable contactor operation and to avoid meter reset due to contactor operation, it is only allowed to operate the contactor when the voltage of power grid is higher than the threshold of contactor operation voltage(50%Un by default).

2.15.2 Control Logic

●Prepaid control at local;

●Remote contactor control;

●Priority: Remote>local. Once the meter receives remote command of disconnection, contactor must disconnect, even though the meter still has credit; once the meter receives remote command of connection, contactor must connect, even though the meter doesn't have credit.

2.15.3 Reason of Operation

- 00: Normal status
- 01: Credit reaches zero, emergency credit has not been used
- 02: Credit reaches zero, emergency credit has been used
- 03: Overload and contactor disconnect
- 04: STS test disconnection
- 05: Meter cover open and contactor disconnect
- 06: Terminal cover open and contactor disconnect
- 07: Remote disconnection of contactor
- 09: Overvoltage and contactor disconnect
- 0C: Under voltage and contactor disconnect
- 0D: reverse current and contactor disconnect
- 0E: neutral line missing and contactor disconnect
- 10: STS test connection
- 20: Remote connection of contactor

Note: If contactor disconnection is caused by meter cover open or terminal cover open, contactor will remain disconnected, even if meter cover and terminal cover are closed. Under this circumstance, the meter needs a TOKEN to clear the events to connect the contactor.

2.16 RTC

- Calendar, time and leap year switch available;
- MCU internal RTC module, with 32768Hz crystal as clock source;
- Frequency correction to 32768 required;
- Accuracy0.5 s/d under normal temperature.

2.17 Battery

- Lithium battery, the capacity is 1200 mAh.
- When power off, meter starts to use battery to maintain RTC, LCD display, button operation and event recording.
- When low battery is detected, LCD displays .
- Lifetime is from 3~5 years, if meter works only with battery constantly.
- Battery is replaceable. User can only replace battery when the power is off. If battery must be

replaced during power on, the user shall be extremely careful and not get shocked.

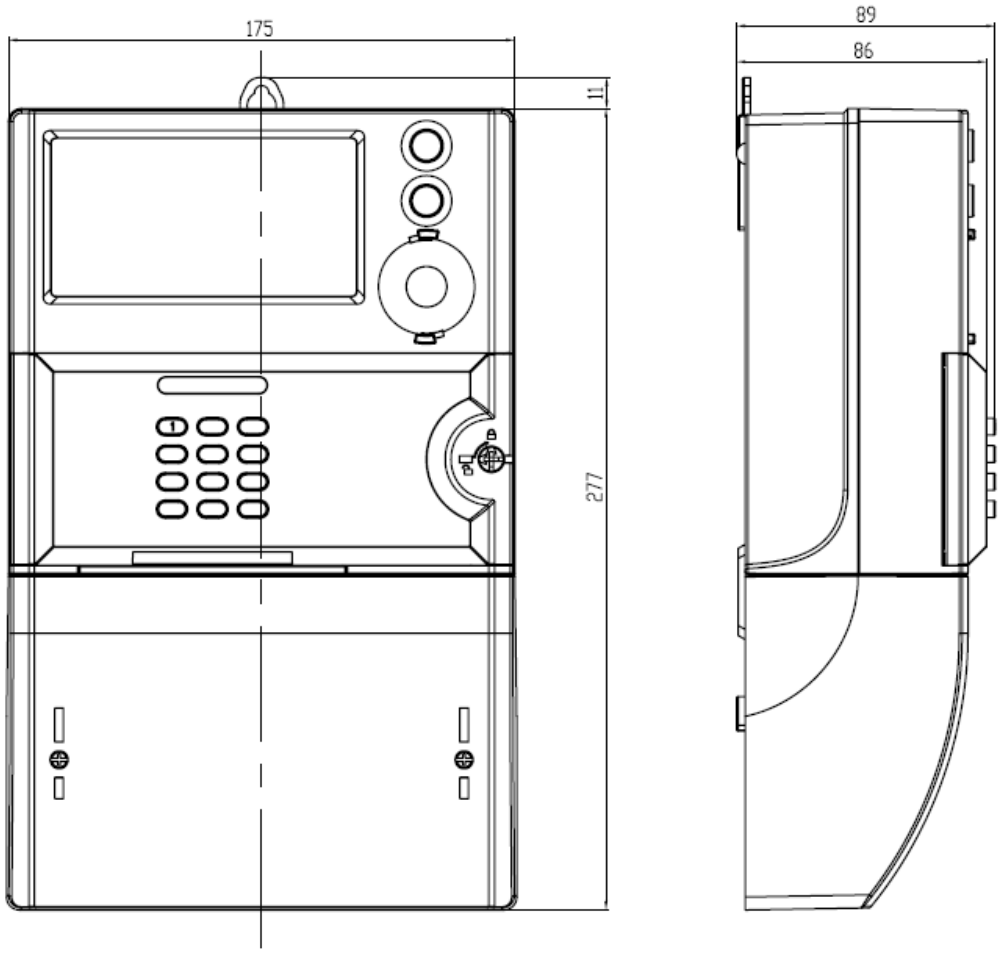
●It is highly recommended to replace battery within 1 minute when power on or synchronize RTC after battery replacement.

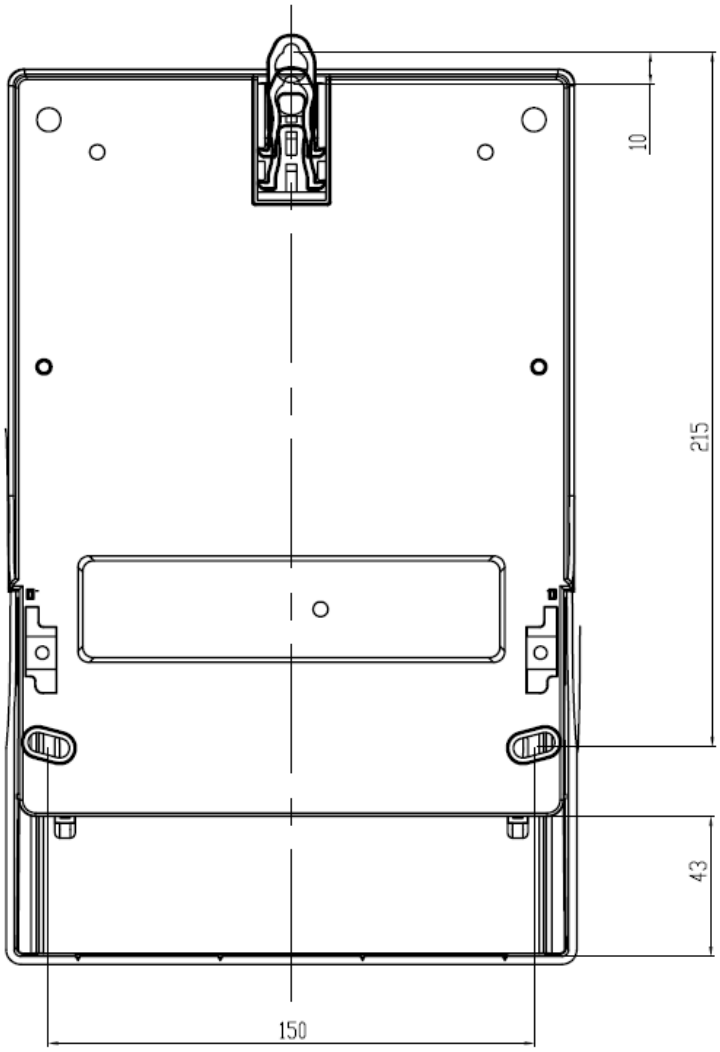
3. Dimensions and Installation

3.1 Dimensions

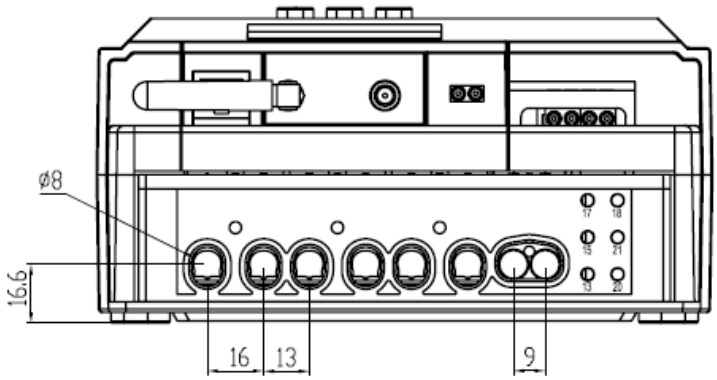
Length×width×height＝277mm×175mm×89mm

3.1.1 Outline Drawing

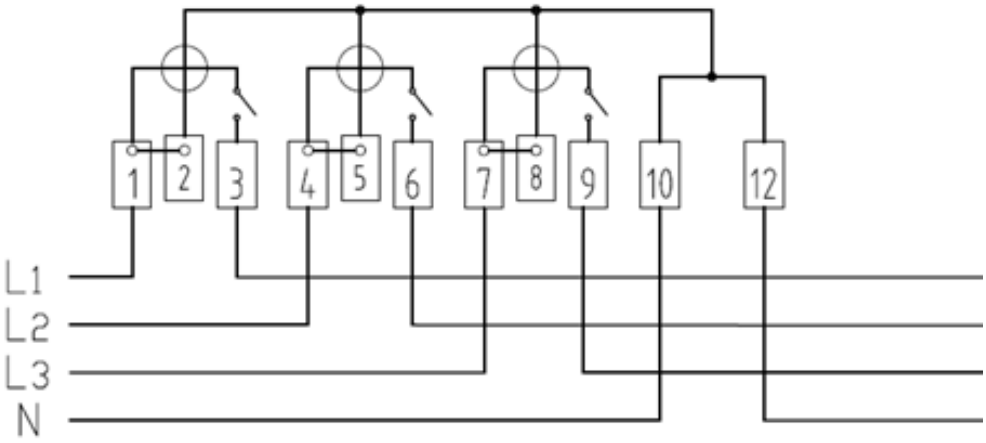




3.1.2 Terminal Block Drawing



3.2 Connection Diagram



3.3 Installation Requirements

The prepaid keypad meter should be installed correctly as this could determine the meter functionality and lifespan. Please follow the prescribed procedures carefully.

When selecting a suitable position for the meter, the following should be considered:

- Security (indoors or outdoors) against tampering.
- General safety consideration in case of possible electric shock, fire, etc.
- For safety consideration, and avoid damage to the meter, install the meter where is far away from any water tap.
- Keep the energy meter away from a stove or heater, or any compliance which will produce heating exceeds meter's limited heat withstand.
- Keypad of the meter should be accessible by user.
- The meter should be installed in a dry ventilated place to ensure the installation and use of meter is secure and reliable. At places that are dirty or might damage the meter, a protection cabinet or box shall be used to protect the meter.
- The meter should be fixed in a firm, fire-resistant surface that do not shake easily.

NOTE Make sure to disconnect the power of the power network before installing the meter.

4. Storage and transportation

Meters should be stored under temperature -25℃～+60℃, the humidity is <85%. The meter should not be crashed during transportation and storage.

Annex A

Display item	OBIS	Format
Total active energy	1.8.0	XXXXXX.XX
Total active energy(-)	2.8.0	XXXXXX.XX
Date	0.9.2	DD-MM-YY
Time	0.9.1	hh:mm:ss
Voltage-phase A	32.7.0	XXX.X
Voltage-phase B	52.7.0	XXX.X
Voltage-phase C	72.7.0	XXX.X
Current-phase A	31.7.0	XXX.XXX
Current-phase B	51.7.0	XXX.XXX
Current-phase C	71.7.0	XXX.XXX
Active power-phase A	21.7.0	XX.XXXX
Active power-phase B	41.7.0	XX.XXXX
Active power-phase C	61.7.0	XX.XXXX
Power factor-phase A	33.7.0	X.XXX
Power factor-phase B	53.7.0	X.XXX
Power factor-phase C	73.7.0	X.XXX
Frequency	14.7.0	XX.XX
AB phase angle	81.7.1	XXX.X
AC phase angle	81.7.2	XXX.X
Credit	c.51.0	XXXXXX.XX
Maximum power	1.35.0	XX.XXXX
3-phase unbalance	11.39.0	XX.XXXX
Meter No.	12.1.0	NNNNNNNN
SGC No.	c.51.3	NNNNNN
overdraft limit	c.51.1	XXXXXX.XX
Low credit alarm 1	c.51.6	XXXXXX.XX
Low credit alarm 2	c.51.7	XXXXXX.XX
Low credit alarm 3	c.51.8	XXXXXX.XX
total active energy of last 1 month	98.1.1	XXXXXX.XX

total active energy of last 2 month	98.1.2	XXXXXX.XX
total active energy of last 3 month	98.1.3	XXXXXX.XX
total active energy of last 4 month	98.1.4	XXXXXX.XX
total active energy of last 5 month	98.1.5	XXXXXX.XX
total active energy of last 6 month	98.1.6	XXXXXX.XX
Total active energy of yesterday	98.2.1	XXXXXX.XX
Total active energy of current month	1.9.0	XXXXXX.XX
Date of last recharge	99.3.1	DD-MM-YY
Time of last recharge	99.3.2	hh:mm:ss
rechargingamount of last recharge	99.3.3	XXXXXX.XX
Total times of power-off	99.4.1	NNNN
Total recharging amount	c.51.9	XXXXXX.XX

NOTE: Information in this document is subject to change without notice. The information is accurate at the time of printing (March, 2013) © Hexing Electrical

Hexing Electrical

Add: Shangcheng Industrial Zone, 1418 Moganshan Road, Hangzhou, China

TEL: +86-571-28020767/769

FAX: +86-571-28029263

www.hxgroup.cn

market@hxgroup.co